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Preferential processing of self-relevant stimuli occurs mainly at the perceptual and conscious stages of information processing

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ABSTRACT

Self-related stimuli, such as one's own name or face, are processed faster and more accurately than other types of stimuli. However, what remains unknown is at which stage of the information processing hierarchy this preferential processing occurs. Our first aim was to determine whether preferential self-processing involves mainly perceptual stages or also post-perceptual stages. We found that self-related priming was stronger than other-related priming only because of perceptual prime-target congruency. Our second aim was to dissociate the role of conscious and unconscious factors in preferential self-processing. To this end, we compared the "self" and "other" conditions in trials where primes were masked or unmasked. In two separate experiments, we found that self-related priming was stronger than other-related priming but only in the unmasked trials. Together, our results suggest that preferential access to the self-concept occurs mainly at the perceptual and conscious stages of the stimulus processing hierarchy.

1. Introduction

The sound of our name usually signals some potentially important events, for example, that someone wants to warn us, praise us, or to start a conversation with us. Thus, it is likely that through mechanisms of associative learning people start to react to their name preferentially. That is, they react more quickly and accurately to their own name than to other people's names. Crucially, because one's own name is heard countless times in everyday life, and because automaticity develops as a function of repetition, this stimulus becomes processed in an unintentional, involuntary, and cognitively effortless manner. Indeed, many studies support that the processing of self-relevant stimuli is preferential and largely automatic (Arnell, Shapiro, & Sorensen, 1999; Bargh, 1982; Brédart, Delchambre, & Laureys, 2006; Gray, Ambady, Lowenthal, & Deldin, 2004; Moray, 1959; Shapiro, Caldwell, & Sorensen, 1997; Wolford & Morrison, 1980; but see Breska, Israel, Maoz, Cohen, & Ben-Shakhar, 2011; Devue, Van der Stigchel, Brédart, & Theeuwes, 2009; Gronau, Cohen, & Ben-Shakhar, 2003; Kawahara & Yamada, 2004). Over the years, this automaticity of self-processing has been used as an argument that self-related factors are influencing information processing at a very early level of the cognitive hierarchy and therefore shape perceptions of the world and other people in a very profound way. Such early self-biases have important implications for basic mechanisms of cognitive functioning, as well as for theories of implicit social cognition (e.g., Greenwald et al., 2002). However, to the best of our knowledge, no existing studies have tracked the processing of self-relevant information

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all the way from the unconscious and perceptual levels to the conscious and conceptual levels. As a result, the stage of the cognitive hierarchy at which the self-prioritization actually occurs remains unknown.

The mental self-representation likely consists of stimulus-specific perceptual components, as well as more abstract modality-independent components (e.g., Morin, 2006; Newen & Vogeley, 2003). Self-preferential processing at the perceptual level is a well-established phenomenon (Pannese & Hirsch, 2010; Tong & Nakayama, 1999), which also likely takes place in some animals, e.g., dogs preferentially react to their own name. What is unclear, however, is whether preferential access to self also occurs at the conceptual level. It has been shown that being exposed to one's own odor and hearing or seeing one's own name facilitates the subsequent recognition of one's own face. In contrast, these cross-modal priming effects were absent for familiar and unknown faces (Platek, Thomson, & Gallup, 2004). This result suggests that preferential conceptual processing is specific to self; however, other studies have shown that conceptual priming facilitates the recognition of any familiar person, which undermines the specificity of preferential conceptual self-access (e.g., Boehm & Sommer, 2012; Brédart, 2004). As a consequence, the precise role of post-perceptual factors in self-preferential processing is unknown.

Another issue that remains unknown is how conscious and unconscious factors contribute to the "self-prioritization effect." The majority of previous studies used only supraliminal presentations of stimuli. As a result, these studies could not dissociate between aware and unaware aspects of self-preferential processing (e.g., Arnell et al., 1999; Brédart et al., 2006; Tacikowski, Cygan, & Nowicka, 2014; Turk, Cunningham, & Macrae, 2008). Several studies used subliminal presentations of stimuli and showed that the self-preferential processing occurs even if conscious access is largely reduced or eliminated (Alexopoulos, Muller, Ric, & Marendaz, 2012; Pannese & Hirsch, 2010; Pfister, Pohl, Kiesel, & Kunde, 2012; Wentura, Kulfanek, & Greve, 2005). However, the above studies did not compare aware and unaware self-effects directly; thus, it is unclear whether (i) self-prioritization occurs mainly at the unconscious level, without additional self-prioritization at the conscious level, or (ii) whether self-preference occurs independently at both levels of information processing.

The present study had two aims: (i) to determine whether preferential access to self-representation occurs only at the perceptual level or also at the semantic stages of information processing; and (ii) to determine how conscious and unconscious factors contribute to preferential self-processing. We used a $2 \times 2 \times 2$ factorial design, with "person" (self vs. other), "type of priming" (perceptual vs. semantic), and "masking" (masked vs. unmasked) as the factors. The experimental task required participants to decide whether stimuli (e.g., names, surnames, dates of birth, or nationality codes) shown on a computer screen at the end of each trial (targets) were related to themselves or to another person (Fig. 1A and B). Before each target, a prime was briefly presented that was either congruent (i.e., self–self or other–other) or incongruent (i.e., self–other or other–self) with the following target. The prime-target congruency was based either on perceptual features (e.g., own-name–own-name) or on semantic features (e.g., own-name–own-surname). Conscious processing of primes was manipulated using a visual masking method. In half of the trials, the primes were immediately preceded and followed by visual masks ("XYXYX" strings), making the aware processing of these primes difficult. In the other half of the trials, no mask was used, making the aware processing of these primes easy compared with the masked primes. All other aspects of the stimuli presentation (e.g., location, duration, task-demands, etc.) were identical between the masked and unmasked trials, as well as between perceptual and semantic trials. Our dependent variable was the degree of different types of priming, which was calculated as the difference between RTs from respective incongruent and congruent trials.

We hypothesized that if preferential access to the self-representation occurs at the conceptual level, then we should find a significantly stronger semantic priming in the "self" than in the "other" condition. Furthermore, we reasoned that if self-preference occurs both at the unconscious and conscious levels, then we should find a significant interaction between "person" and "masking" factors, where self-specific priming ("self" > "other") is present in the masked trials but is even stronger in the unmasked trials. In contrast, finding the main effect of "person" ("self" > "other") without an interaction effect would suggest that preferential processing of self-relevant information occurs mainly at the unconscious level and that this effect is only "carried over" to the conscious level.

2. Experiment I

2.1. Materials and methods

2.1.1. Participants

Twenty-four naïve, right-handed subjects (mean age: 27 ± 5, nine females) participated in this study. All participants were healthy, reported no history of psychiatric illness or neurologic disorder, and had normal or corrected-to-normal vision. All participants gave their written informed consent before the start of the experiment. The Regional Ethical Review Board of Stockholm approved the study.

2.1.2. Stimuli and procedure

As experimental stimuli, we used first names, surnames, dates of birth, and nationality codes that referred either to a participant (self-related) or to an unknown person (other-related). Before the study each participant was asked whether he or she knows anyone with the same name and surname as the "other" in their stimulus set; none of the participants did. Nationality was indicated by a three-letter code (e.g., "FRA" for France) according to the ISO 3166 norm. Dates were given in the "YYYY/ MM/DD" format. All words were written in white capital letters (Arial font; size ranging from 3×1 to